

Application No. 09/924,293
Response to Office Action

Customer No. 01933

Listing of Claims:

1. (Currently Amended) A semiconductor device comprising:
a semiconductor substrate including a circuit
element-forming region in which an integrated circuit is formed,
and a plurality of connection pads;

5 an organic insulating film formed on said circuit element-
forming region;

a plurality of columnar electrodes which each have an upper
edge surface outwardly exposed for connection to an external
device, including at least one columnar electrode formed over the
10 circuit element-forming region; , and which are each electrically
connected to at least one of said plurality of connection pads;

a plurality of conductive layers formed on the organic
insulating film and electrically connecting at least the
connection pads and the at least one columnar electrode arranged
15 over the circuit element-forming region;

at least one thin film passive element including ~~at least~~
~~one~~ a conductive layer formed on said insulating film, wherein
the conductive layer of the thin film passive element and the
plurality of conductive layers are laterally arranged and formed
20 by a same layer of the semiconductor device; and

a sealing film which is provided between the columnar
electrodes, and which covers the thin film passive element and

Application No. 09/924,293
Response to Office Action

Customer No. 01933

the semiconductor substrate except for the upper edge surface of each of the columnar electrodes.

2. (Previously Presented) The semiconductor device according to claim 1, wherein said thin film passive element comprises at least one capacitance element.

3. (Previously Presented) The semiconductor device according to claim 2, wherein:

said capacitance element includes two conductive layers and a dielectric material layer,

5 said two conductive layers are stacked one upon the other on said insulating film, and

said dielectric material layer is interposed between the conductive layers.

4. (Previously Presented) The semiconductor device according to claim 2, wherein:

said at least one conductive layer of said capacitance element includes at least two portions having opposing end
5 surfaces and formed in one layer on said insulating film, and
a dielectric material layer is formed in a clearance between the opposing end surfaces of the at least two portions.

Application No. 09/924,293
Response to Office Action

Customer No. 01933

5. (Previously Presented) The semiconductor device according to claim 2, wherein:

said at least one conductive layer of said capacitance element includes at least two portions having opposing end surfaces and formed in one layer on said insulating film,

said columnar electrodes are formed as plate-like electrodes respectively positioned on the at least two portions, and

a dielectric material layer is formed at least in a clearance between the opposing end surfaces of the plate-like electrodes.

6. (Previously Presented) The semiconductor device according to claim 1, wherein said thin film passive element comprises at least one inductance element.

7. (Previously Presented) The semiconductor device according to claim 6, wherein:

said inductance element includes one conductive layer having one of an angular eddy shape, a rectangular wave shape, and a loop shape,

said connection pads include at least one first connection pad that is not electrically connected to any of said columnar electrodes, and at least one second connection pad electrically connected to at least one of said columnar electrodes, and

Application No. 09/924,293
Response to Office Action

Customer No. 01933

10 said inductance element includes at least two terminals, at least one of which is connected to at least one of said first connection pad and said second connection pad.

8. (Previously Presented) The semiconductor device according to claim 7, wherein said inductance element further comprises a magnetic film formed on said one conductive layer.

9. (Previously Presented) The semiconductor device according to claim 1, wherein said thin film passive element includes at least two terminals, at least one of which is electrically connected to one of said columnar electrodes.

10. (Previously Presented) The semiconductor device according to claim 1, wherein said thin film passive element includes at least two terminals, at least one of which is electrically connected to one of said connection pads.

11. (Previously Presented) The semiconductor device according to claim 1, wherein said thin film passive element includes at least two terminals, each of which is electrically connected to at least one of said connection pads and said
5 columnar electrodes.

Application No. 09/924,293
Response to Office Action

Customer No. 01933

Claim 12 (Canceled).

13. (Previously Presented) The semiconductor device according to claim 1, wherein said at least one thin film passive element comprises a plurality of thin film passive elements.

14. (Currently Amended) A method of manufacturing a semiconductor device comprising:

preparing a semiconductor wafer substrate including a plurality of chip forming regions each having a circuit element-forming region in which an integrated circuit is formed, and a plurality of connection pads;

forming an organic insulating film on the circuit element-forming region of each of said chip forming regions;

forming a plurality of conductive layers connected to the connection pads;

forming a plurality of columnar electrodes which are provided for connection to an external device, and which are each electrically connected to at least one of said plurality of connection pads through said plurality of conductive layers, wherein at least one of said plurality of columnar electrodes is formed on said circuit element-forming region;

forming a plurality of thin film passive elements each including ~~at least one~~ a conductive layer on said organic

Application No. 09/924,293
Response to Office Action

Customer No. 01933

20 insulating film, wherein the conductive layer of the thin film
passive element and the plurality of conductive layers are
laterally arranged and formed by a same layer of the
semiconductor device;

25 forming a sealing film on an exposed entire upper surface of
the semiconductor wafer substrate between the columnar electrodes
and covering the thin film passive elements and the columnar
electrodes;

exposing only an upper edge surface of each of the columnar
electrodes from the sealing film; and

30 dividing said semiconductor wafer substrate into individual
chip forming regions so as to form a plurality of semiconductor
devices each having at least one of said thin film passive
elements.

15. (Previously Presented) The method of manufacturing a
semiconductor device according to claim 14, wherein said forming
of said thin film passive elements comprises forming at least one
capacitance element.

16. (Previously Presented) The method of manufacturing a
semiconductor device according to claim 15, wherein said forming
of each said capacitance element comprises:

Application No. 09/924,293
Response to Office Action

Customer No. 01933

forming a first conductive layer on the circuit
5 element-forming region of said semiconductor substrate;
forming a dielectric material layer on said first conductive
layer; and
forming a second conductive layer on said dielectric
material layer.

17. (Previously Presented) The method of manufacturing a
semiconductor device according to claim 15, wherein said forming
of each said capacitance element comprises:

forming on said insulating film one conductive layer having
5 at least two portions having opposing end surfaces; and
forming a dielectric material layer in a clearance between
the opposing end surfaces of the at least two portions.

18. (Previously Presented) The method of manufacturing a
semiconductor device according to claim 15, wherein said forming
of each said capacitance element comprises:

forming on said insulating film one conductive layer having
5 at least two portions having opposing end surfaces;
forming said columnar electrodes as plate-like electrodes
which are opposed to each other respectively on the at least two
portions; and

Application No. 09/924,293
Response to Office Action

Customer No. 01933

forming a dielectric material layer in a clearance between
10 said opposed plate-like electrodes.

19. (Previously Presented) The method of manufacturing a semiconductor device according to claim 14, wherein said forming of said thin film passive elements comprises forming at least one inductance element.

20. (Previously Presented) The method of manufacturing a semiconductor device according to claim 19, wherein said forming of each said inductance element comprises:

5 patterning one conductive layer in any one of an angular eddy shape, a rectangular wave shape and a loop shape;

forming said connection pads to include at least one first connection pad that is not electrically connected to any of said columnar electrodes, and at least one second connection pad electrically connected to at least one of said columnar
10 electrodes, and

forming at least two terminals, at least one of which is connected to at least one of said first connection pad and said second connection pad.

21. (Previously Presented) The method of manufacturing a semiconductor device according to claim 20, wherein said forming

Application No. 09/924,293
Response to Office Action

Customer No. 01933

of the inductance element further comprises forming a magnetic film on said one conductive layer.

Claim 22 (Canceled).

23. (Previously Presented) The method of manufacturing a semiconductor device according to claim 14, wherein said forming of said thin film passive elements comprises forming at least two terminals, at least one of which is electrically connected to one
5 of said columnar electrodes.

24. (Previously Presented) The method of manufacturing a semiconductor device according to claim 14, wherein said forming of said thin film passive elements comprises forming at least two terminals, at least one of which is electrically connected to one
5 of said connection pads.

25. (Previously Presented) The method of manufacturing a semiconductor device according to claim 14, wherein said forming of said thin film passive elements comprises forming at least two terminals, each of which is electrically connected to at least
5 one of said connection pads and said columnar electrodes.